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Indian Standard

SPECIFICATION FOR SINGLE-SPEED THREE-PHASE INDUCTION MOTORS FOR DRIVING LIFTS

Fourth Reprint OCTOBER 2007
(Including Amendment No 1 & 2)

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BUREAU OF INDIAN STANDARDS
MANAK BHAVAN , 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

Gr 3 *December* 1976

AMENDMENT NO. 2 APRIL 2004
TO
IS 8151 : 1976 SPECIFICATION FOR SINGLE-SPEED THREE-PHASE INDUCTION MOTORS FOR DRIVING LIFTS

(*Page* 4, *clause* **7.1**) — Substitute the following for the existing

'**7.1** Motors for driving lifts are special purpose motors in which the basic mounting dimensions have to be made suitable for the particular lift design Hence the frame size and dimensions of the motors as per this standard shall be as agreed between the supplier and the manufacturer '

[*Page* 5, *clause* **7.2** (see also Amendment No 1)] —Substitute the following for the existing matter

'**7.2 Shaft Extension at Non-driving End** —Suitable shaft extension on non driving end shall be provided for the purpose of hand winding '

(ET 15)

Printed at Prabhat Offset Press, New Delhi-2

AMENDMENT NO. 1 AUGUST 1980

TO

IS:8151-1976 SPECIFICATION FOR SINGLE-SPEED THREE-PHASE INDUCTION MOTORS FOR DRIVING LIFTS

Alteration

(*Page 5, clause 7.2*) - Substitute the following for the existing clause:

'7.2 Shaft Extension at Non-driving End - Square or cylindrical shaft extension for the purpose of of hand winding shall, unless otherwise specified by the purchaser, be provided at the non-driving end of the motor when flywheel is not used. The square shaft extension shall be screened by a shroud with a captive cover.'

(ETDC 15)

Printed at Prabhat Offset Press, New Delhi-2

Indian Standard

SPECIFICATION FOR SINGLE-SPEED THREE-PHASE INDUCTION MOTORS FOR DRIVING LIFTS

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(*Continued on page* 11)

Indian Standard

SPECIFICATION FOR SINGLE-SPEED THREE-PHASE INDUCTION MOTORS FOR DRIVING LIFTS

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 10 August 1976, after the draft finalized by the Rotating Machinery Sectional Committee had been approved by the Electrotechnical Division Council.

0.2 In the preparation of this standard, assistance has been derived from the following standard:

> BS 2655 : Part 2 · 1959 'Lifts, escalators, passenger conveyers and paternosters, Part 2 : Single-speed polyphase induction motors for driving lifts' issued by the British Standards Institution.

0.3 To ensure satisfactory installation and maintenance of induction motors the recommendations contained in IS:900-1965* shall be followed.

0.4 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test, shall be rounded off in accordance with IS:2-1960†. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

1. SCOPE

1.1 This standard covers single-speed three-phase squirrel cage and slipring induction motors for driving lifts for voltages up to and including 650 V.

2. TERMINOLOGY

2.1 For the purpose of this standard, definitions given in IS: 1885 (Part XXXV)-1973‡ shall apply.

3. SITE CONDITIONS

3.0 The normal site conditions are given in **3.1** to **3.3**.

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*Code of practice for installation and maintenance of induction motors.

†Rules for rounding off numerical values (*revised*).

‡Electrotechnical vocabulary Part XXXV Rotating machinery

3.1 Altitude and Temperature — The provisions of **3.1** of IS:325-1970* shall apply.

3.2 Form and Symmetry of Currents and Voltages — The provisions of **3.2** of IS:325-1970* shall apply.

3.3 Voltage and Frequency Variation — The provisions of **3.3** of IS:325-1970* shall apply.

4. TYPES OF ENCLOSURES

4.1 The degree of protection to be provided by enclosures shall be either IP 21, IP 22, IP 23 (screen protected) or IP 44 (totally enclosed) in accordance with IS:4691-1968†.

5. METHODS OF COOLING

5.1 The method of cooling shall be IC 01 or IC 41 in accordance with IS 6362-1971‡

6. PREFERRED VOLTAGES, FREQUENCY AND OUTPUT

6.1 The preferred rated voltage shall be 415 V and rated frequency 50 Hz.

6.2 Preferred Outputs — The preferred output ratings shall be 3, 4 5, 6, 7 5 and 9 kW in accordance with the duty types specified in **9.1** of this standard For output ratings higher than 9 kW, the values shall be subject to agreement between the user and the supplier.

6.3 Preferred Speed — The preferred speed shall be 1000 rev/min (synchronous speed).

Note — The speed other than 1000 rev/min may also be considered as agreed to between the user and the supplier.

7. DIMENSIONS

7.1 The frame sizes shall generally be in accordance with IS:1231-1974§ and IS 2223-1971|| for motors with roller and ball bearings For motors with sleeve bearings, dimension 'C' specified in IS 1231-1974§ may not be relevant.

Note — The output assigned to the frame sizes covered in IS:1231-1974§ may not be applicable

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*Specification for three-phase induction motors (*third revision*).

†Specification for degrees of protection provided by enclosures for rotating electrical machinery

‡Designation of methods of cooling for rotating electrical machines.

§Dimensions of three-phase foot-mounted induction motors (*third revision*).

||Dimensions of flange mounted ac induction motors (*first revision*)

7.2 Shaft Extension at Non-driving End — Square or cylindrical shaft extension for the purpose of hand winding shall, unless otherwise specified by the purchaser, be provided at the non-driving end of the motor. The square shaft extension shall be screened by a shroud with a captive cover.

7.2.1 The recommended size of the square end, the corresponding minimum internal diameter of shroud and its length are given in Table 1 for the various frame sizes.

TABLE 1 RECOMMENDED SIZE OF THE SQUARE END OF SHAFT EXTENSION AND MINIMUM INTERNAL DIAMETER OF SHROUD

FRAME NO. (1)	SIZE OF SQUARE END (2) mm	LENGTH OF SQUARE END (3) mm	MINIMUM INTERNAL DIAMETER OF SHROUD (4) mm	LENGTH OF SHROUD (5) mm
90 to 112	16	25	44	30
132	22	25	56	30
160/180	32	40	70	45
225/250	38	40	83	45

7.2.2 The diameter of cylindrical shaft extension and key size may be the same as for driving end.

7.3 End Play — Unless otherwise specified, end movement of the rotor shall be provided, and this movement shall in no case exceed 3 mm.

8. TERMINAL MARKINGS

8.1 Terminals shall be marked in accordance with IS:4728-1968*.

9. DUTY AND RATING

9.1 Duty — For the purpose of this standard, duty type S_4 (intermittent periodic duty with starting) and S_5 (intermittent periodic duty with starting and electric breaking) shall be applicable in accordance with **9.2.4** and **9.2.5** of IS:325-1970† (*see also* Appendix A for duty cycle of a lift motor).

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*Terminal marking for rotating electrical machinery.

†Specification for three-phase induction motors (*third revision*).

9.2 Assignment of Rating — The assignment of rating shall be made by the manufacturer to signify the capabilities of the lift motor. In addition, since the electrical motors have a time-rate of temperature rise and since the rise of temperature in accordance with this standard is limited, a qualifying term may be used with the term rating to give an indication of the duration for which the motor may be run at the assigned values while complying with this standard

9.3 Assignment of Rating for Test Purposes — For lift motor, it shall be possible to assign to it for testing purposes an equivalent continuous, short time or intermittent rating such that the machine shall satisfactorily meet the actual duty requirements whilst complying with the specified conditions.

10. ROTOR VOLTAGE

10.1 For slipring induction motors, the rotor voltage between sliprings under any operating conditions shall not exceed 750 volts

11. TORQUE CHARACTERISTICS

11.1 A motor rated in accordance with this standard shall be capable of developing, throughout its range of permitted temperature, the breakway torques specified in **11.1.1** and **11.1.2** at rated voltage with the rotor in any position

NOTE — Where a voltage range is specified the breakway torque relates to the lowest voltage of the range and the maximum torque limit may be exceeded at the higher voltage.

11.1.1 *Squirrel Cage Motors* — Not less than 2 25 and not more than 2 75 times the rated full load torque.

NOTE — The torque-speed curve should preferably have a falling characteristic

11.1.2 *Slipring Motors* — Not less than 2 25 times the rated full load torque with suitable external resistance in the motor circuit

NOTE — In determining the breakway torque required to provide satisfactory acceleration of the lift car, for the usual layout conditions and the masses to be accelerated, it is assumed that the rated kW of the motor is based on the minimum running torque required to raise the maximum out-of-balance load

12. TEMPERATURE RISE

12.1 The temperature rise of motors, when operating under the rated conditions and in accordance with the requirements of this standard (*see* **9**) shall not exceed the limits given in Table 2, provided (a) the temerature of the cooling medium does not exceed 40°C and (b) the altitude of the motor does not exceed 1 000 m above sea level (*see* **11** of IS:325-1970* for

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*Specification for three-phase induction motors (*third revision*) methods of measurement of temperature rise and for corrections when motors are intended for service in cooling medium temperatures other than 40°C or at altitudes exceeding 1 000 m)

TABLE 2 LIMITS OF TEMPERATURE RISE

(*Clause* 12.1)

SL No	PART OF MOTOR	CLASS OF INSULATION*					
		E		B		F	
		T† °C	R‡ °C	T† °C	R‡ °C	T† °C	R‡ °C
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
i)	Winding	65	75	70	80	85	100
ii)	Magnetic core and other parts not in contact with winding	The temperature rise of these parts shall in no case reach such a value that there is risk of injury to any insulating or other material on adjacent parts					
iii)	Magnetic core and other parts in contact with winding	75	—	80	—	100	—
iv)	Sliprings§	70	—	80	—	90‖	—

*The classification of insulating materials is given in IS 1271-1958 'Classification of insulating materials for electrical machinery and apparatus in relation to their thermal stability in service'.

†Thermometer method.

‡Resistance method.

§The temperature rises are permissible provided that insulation appropriate to the temperature rise is used, except where the slipring is adjacent to windings in which case the temperature rise should not exceed that for the winding insulation class. The values of temperature rises given apply only to the measurements made by bulb type thermometers.

‖Special precautions may be necessary in using temperature rise of 90°C in the choice of brush grades, etc.

13. NOISE LIMITS

NOTE 1 — Noise limits are under consideration.

NOTE 2 — Information on quietness of operation is given in Appendix B.

14. TESTS

14.1 General — The provisions of **19.1** of IS : 325-1970* shall apply.

14:2 Test Certificates — The provisions of **19.2** of IS:325-1970* shall apply.

14.3 Classification of Tests — The provisions of **19.3** of IS·325-1970* shall apply.

14.4 High Voltage Test — The provisions of **20** of IS:325-1970* shall apply

14.5 Insulation Resistance Test — It shall be carried out in accordance with **21.1** of IS: 325-1970*.

15. LIMITS OF VIBRATION

15.1 The level of vibration of the lift motors shall conform to precision class A or class B in accordance with IS:4729-1968†.

16. BREAKWAY STARTING CURRENT

16.1 Breakway Starting Current of the Squirrel Cage Motors — It shall not exceed 5 times the full load current with rated voltage applied.

17. EARTHING

17.1 Earthing of the motor shall be done in accordance with the relevant provisions of IS:3043-1966‡.

18. RATING PLATE

18.1 A rating plate giving information in accordance with **17.1** of IS 325-1970* shall be supplied with each motor.

18.2 The product may also be marked with Standard Mark

18.2.1 The use of the Standard Mark is governed by the provisions of the Bureau of Indian Standards Act, 1986 and the Rules and Regulations made thereunder The details of conditions under which the licence for the use of Standard Mark may be granted to manufactures or producers may be obtained from the Bureau of Indian Standards

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*Specification for three-phase induction motors (*third revision*).

†Measurement and evaluation of vibration of rotating electrical machines.

‡Code of practice for earthing.

19. INFORMATION TO BE GIVEN WITH ENQUIRY AND ORDER

19.1 The provisions of **18.1** and Appendix A of IS:325-1970* shall apply.

> NOTE — Information required in items 18 and 19 of Appendix A of IS:325-1970* shall not be applicable to these types of motors In item 12 of Appendix A of IS:325-1970*, reference to maximum temperature of water shall also be not applicable.

19.2 In addition to information mentioned in **19.1**, the following particulars should also be supplied:

a) Type of bearings — sleeve or ball or roller,

b) Type of shaft extention required on the non-driving end of the motor (**7.2**),

c) Amount of end play required (**7.3**);

d) Where any special methods of starting or retardation are to be employed, details of these, and their effect on the duty cycle should be stated (*see* Appendix A),

e) Maximum out-of-balance load of lift and rated car speed,

f) Maximum static torque against which motor shall start at gear input shaft with out-of-balance load as given in **19.2**(e),

g) Rotational kinetic energy (GD^2) of driven equipment at rated speed referred to motor shaft and including the coupling brake drum and flywheel (if any), and

h) Gear efficiency at standstill, at rated speed with out-of-balance load as given in **19.2**(e)

APPENDIX A

[*Clauses* 9.1 *and* 19.2 (d)]

DUTY CYCLE OF A LIFT MOTOR

A-1. A lift motor operates on a continuous duty cycle of widely varying periods and outputs A duty cycle with a greater number of starts per hour is possible with a slipring motor as compared with a squirrel cage motor of similar size, because of losses during the starting period — which forms an appreciable proportion of the total losses — are mainly concentrated in the external secondary circuits associated with a slipring motor

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*Specification for three-phase induction motors (*third revision*)

A-2. In normal practice, a single speed motor for a lift is in circuit for starting and running only, retardation being effected by means of a brake external to the motor The duty types in such cases are illustrated as below:

a) Duty type S_4, CDF 15 to 25 percent, Cycles/h 90, FI 10

b) Duty type S_4, CDF 15 to 25 percent, Cycles/h 120, FI 10

c) Duty type S_4, CDF 15 to 40 percent, Cycles/h 180, FI 10

A-3. Where other methods are to be employed to produce retardation, such as reverse current braking (plugging), dynamic braking (dc excitation) or eddy-current or any form of braking taking place while the motor is still energised, duty type S_5 is applicable and details of the method of retardation should be specified.

A-4. As most of the power consumption of the lift motor occurs during starting, the efficiency and power factor at rated output should not be considered as criteria of the performance and power consumption of a lift

APPENDIX B

(*Clause* 13)

QUIETNESS OF OPERATION

B-1. Where a high degree of quietness is essential in buildings, such as offices, flats, or hospitals, the motor noise should be reduced to a minimum. In factories or industrial buildings or where the general background noise is high, the average motor noise is unimportant and the extra cost involved in producing a particularly quiet running motor is not then justified

B-2. The general subject of noise and vibration is involved. The extent to which the noise is a nuisance depends on such characteristics as intensity, frequency and presence of beats and also on the noise level of the background. Transmitted noise can be of two kinds:

a) Air-borne, and

b) Structure borne

B-3. Air-borne noise may be reduced by the suitable housing of the lift equipment in the machine room, and structure-borne noise is transmitted through the building structure and as it can be amplified by structural features of the building, complicated and unlooked for effects may be produced, the elimination or reduction of which requires the co-operation of the architect and the liftmaker.

(*Continued from page* 2)

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